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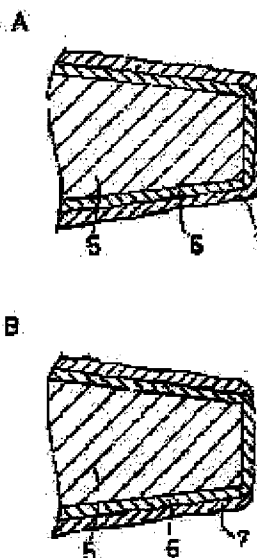
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(54) CONTACT FOR ELECTRONIC EQUIPMENT AND ITS MANUFACTURE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a stable and long-life contact by covering the contact part of a base body made of Va or Via group metal or their metal alloy, with gas-phase-synthesized diamond, and by covering the outer surface of the covered contact part with metal.

SOLUTION: A W-needle-like body 5 is formed of high-purity W wire having a diameter of about 0.25mm with no crack, cut and processed at its front end part. Then, it is washed and introduced into a CVD device so as to form a diamond clad 6 over the front end part of the body 5 by gas-phase synthesization. The clad 6 has a thickness of about 3 to 10 μ m, and is then formed over its outer surface with an Ni clad 7 having a thickness of about 3 to 5 μ m by electroless plating. Thus formed needle-like body 5 can be used by being bent. Even though the front end face of the clad 7 is worn so as to expose the clad 6 after using, the clad 6 can also sufficiently break the oxide film so that the clad 7 at one side surface carried out electrical conduction. The clad 6 is hard, highly wear-resistant and stable, and can perform long-life probing. Further, the completely same effects as that obtained by W can be obtained even with the use of Mo or Cr of Va group or Ta, Mb or V of Via group.



LEGAL STATUS

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of rejection]

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CLAIMS

[Claim(s)]

[Claim 1] Contact for electronic equipment characterized by the contact section being covered with the diamond by the vapor phase synthetic method of the base which consists of single metals or these alloys of Va group or a VIa group, and coming to give metallic coating to the outside surface of this covering at least.

[Claim 2] Metallic coating which covering of a diamond was not dense and performed to the outside surface of this covering is contact according to claim 1 characterized by having pasted the direct base partially.

[Claim 3] A base is contact according to claim 1 or 2 which is a probe card pin.

[Claim 4] The manufacture approach of contact according to claim 1, 2, or 3 characterized by providing the process which inserts a base in a microwave CVD system and gives diamond covering, and the process which performs metal plating on this diamond covering outside surface.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to contact for electronic equipment which carries the probe for continuity tests, and the chip and circuit tester of for example, an IC and an LSI chip and which is used as a contact fixture etc.

[0002]

[Description of the Prior Art] The taper section B which drawing 4 shows one example of blow BUPIN 1 made from W, and ground 50 micrometers of diameters A of a pin apical surface is 3000 micrometers and the bending angle C. 103 degrees and pin diameter D It is formed in 250 micrometers.

[0003] Drawing 5 A shows one example of the continuity test by above-mentioned blow BUPIN 1, and the point A of blow BUPIN 1 attached in the epoxy probe card base 2 contacts the bonding pad 4 of a large number prepared on the LSI die 3, and breaks and flows through the oxide skin of an electrode surface. In order to break this oxide skin, blow BUPIN 1 is relatively moved like the arrow head of *** drawing 5 B with which that point A contacted.

[0004] Touch TADAUN of this contact, migration, and balking has the problem referred to as that stable blow BINGU is obtained by neither adhesion of a repetition line crack and the aluminum waste to Point A, nor *** of Point A.

[0005]

[Problem(s) to be Solved by the Invention] Since the increase of the number of pins and a bonding pad pitch become small with high integration of LSI, and the formation of little insincere of a package, the above-mentioned problem is still more serious. although adhering a diamond particle at the tip of a pin with nickel plating and the contact approach with a pin mold are also considered in order to prevent ***, it is at last — it cannot say that it is enough, but it is stabilized, and long lasting contact is called for.

[0006]

[Means for Solving the Problem] Also in said conventional pin type of blow BINGU, also in contact which has the contact section in which it projected other than the pin mold, this invention is an ingredient which has necessary reinforcement, and is what chose the possible thing of covering of a diamond with the vapor phase synthetic method, and reached as a result of the prototype, and comes to have the following descriptions.

[0007] It is contact which consists of single metals or these alloys of Va group or a V1a group and which prepares covering of the diamond according to a vapor phase synthetic method to the contact section at least to bases, such as needlelike or tabular, and comes to give metallic coating at the outside surface of the covering.

[0008] It is also one of the another descriptions not to make covering of the above-mentioned diamond dense, but to consider as the configuration which the one section of metallic coating on an outside surface pasted up on the direct base.

[0009] A base is needlelike and being used as a probe card pin is also one of the descriptions.

[0010] Furthermore, the one description is providing the process which inserts a base in a microwave CVD system and gives diamond covering, and the process which performs metal

plating on this diamond covering external surface as an approach of manufacturing above contact, now.

[0011]

[Embodiment of the Invention]

[Example] Drawing 1 is the side elevation of the W style 5 which carried out cutting processing and manufactured W line, and, for a diameter and L, die length and B are [D / a point angle and A of the point die length of a taper and theta] apical surface diameters. 7 is covering of nickel put with nonelectrolytic plating after the diamond covering 6 formed by the vapor phase synthetic method mentioned later.

[0012] The dimension of each part of the W style 5 is as being shown in Table 1, and is purity with a diameter of 0.25mm. After confirming that there is no crack applying W line near 100% to an ultrasonic flow detector, cutting and tip processing were performed and produced.

[0013]

[Table 1]

針状体の寸法

	Amm	Bmm	Dmm	Lmm
実 施 例	φ0.03	3.0	φ0.25	40
	φ0.05	3.0	φ0.25	40

[0014] Granularity of the front face of this W style 5 With 0.2micromRa extent, this was often washed, it inserted in the CVD system, and the diamond 6 was covered with the following conditions to that point. In addition, the charge put [it turned the point up, poked them and] and held a majority of W styles 5, and performed them to the hole aperture maintenance plate made from Si.

[0015]

The equipment used A heat filament CVD system microwave CVD system (style insertion number) 400-600 Book 100 H2 Flow rate 1000CCM 200CCM CH4 Flow rate 12CCM 2CCM Pressure 100Torr 30Torr Base material temperature 900 degrees C 900 degrees C Holding time 7 hours 7 hours [0016] The thickness of the formed diamond covering 6 is 3-10 micrometers, and as the side cross section at a tip was expanded and shown in drawing 2 A, it formed the nickel covering 7 with nonelectrolytic plating on the outside surface at 3-5-micrometer thickness.

[0017] The formed covering style 5 to write is bent the shape of a probe card pin and isomorphism shown in drawing 4 , processes it and is used. The apical surface of the nickel covering 7 **** drawing 2 B by use, and the condition that the diamond covering 6 was exposed is shown. Even if it becomes this form, an oxide skin can be enough broken by the exposure, and the nickel covering 7 of a side-face part can perform a flow. And since aluminum waste etc. could not adhere easily and the exposure exceeds in abrasion resistance firmly, it is long lasting and blow BINGU moreover stabilized can be performed.

[0018] Drawing 3 A does not make a stop and covering dense for formation of the diamond covering 6 in the phase of initial nucleation, but leaves an about 3-micrometer clearance between diamond particles, and gives nickel covering 7 on it. Therefore, the nickel covering 7 has adhered to the W style 5 directly partially.

[0019] It is used like drawing 2 B, the condition of having ****(ed) is shown, abrasion resistance is maintained by coexistence of a diamond particle and nickel covering, and drawing 3 B has the features that a flow is also referred to as good.

[0020] If the front face is pure, even if W style has sufficient reinforcement, and it will not perform surface treatment exceptionally, covering of a diamond is easy by the vapor phase synthetic method. And it adheres to formed covering firmly, and raw [of deformation and the ****] is not carried out with the reinforcement of W, and the abrasion resistance of diamond covering, but a necessary flow is obtained by nickel covering.

[0021] Since this effectiveness is expectable in Va group list of Mo and Cr which are W and a

refractory metal of the same kind also in a VIa group's Ta, Nb, and V to be shown in Table 2, it can be changed to W depending on the need, and other metal of this Va group and a VIa group or its alloy can be used for it.

[0022]

[Table 2]

金属元素の弾性率Eと剛性率G

金 属	T _K	E _{10¹¹Pa}	G _{10¹¹Pa}
W	298	4.027	—
Mo	293~298	3.27	1.206
Cr	298	2.53	—
Ta	298	1.811	—
Nb	293	1.046±0.02	0.373

[0023] Moreover, although the covering metal showed the example of nickel, since it gives in order to maintain conductivity, Ti-Pt-Au, Ti, etc. with still more sufficient conductivity can use other metals, and can also choose coating according to it. It seemed that the direction depended on a microwave method from the heat filament method was suitable in the phase of a prototype in order to obtain detailed diamond covering. In addition, diamond-like carbon may be contained in a diamond.

[0024]

[Effect of the Invention] According to this invention, contact which can do probing by which useful life longevity was stabilized for a long time can be offered easily.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the side elevation showing the configuration of W style of an example, and a dimension.

[Drawing 2] It is a drawing explaining the condition that the enlarged drawing of the side cross section of the point of drawing 1 ****(ed) A, and the tip of A ****(ed) B.

[Drawing 3] It is a drawing explaining the condition that the enlarged drawing of the side cross section of the point of an example different from drawing 2 ****(ed) A, and the tip of A ****(ed) B.

[Drawing 4] It is a side elevation explaining one example of the conventional probe card pin.

[Drawing 5] The schematic diagram and B A explains one example of the continuity test by the pin of drawing 4 to be are the partial enlarged drawing.

[Description of Notations]

1 Probe Card Pin

2 Epoxy Probe Card Base

3 LSI Die

4 Bonding Pad

5 W Style

6 Diamond Covering

7 Nickel Covering

A The apical surface diameter of W style (apical surface diameter of a probe card pin)

B The point details die length of W style

C The angle of bend of a probe card pin

D The diameter of W style (diameter of a probe card pin)

L The die length of W style

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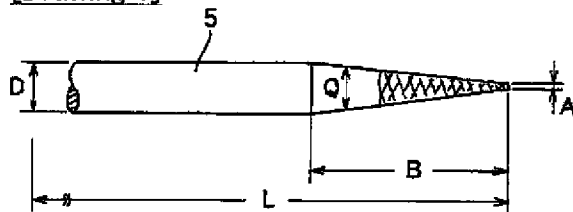
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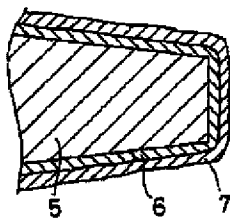
DRAWINGS

[Drawing 1]

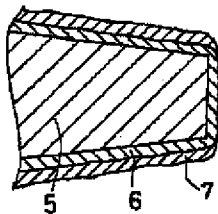


[Drawing 2]

A

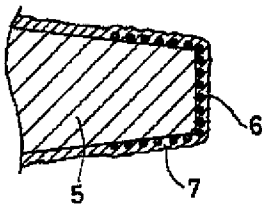


B

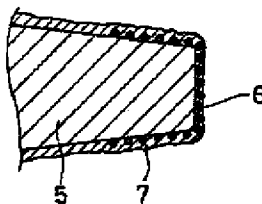


[Drawing 3]

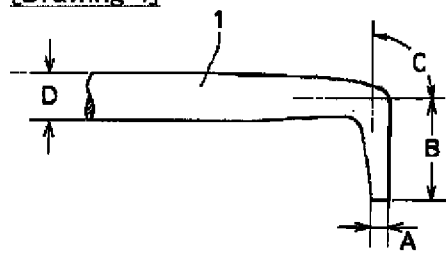
A



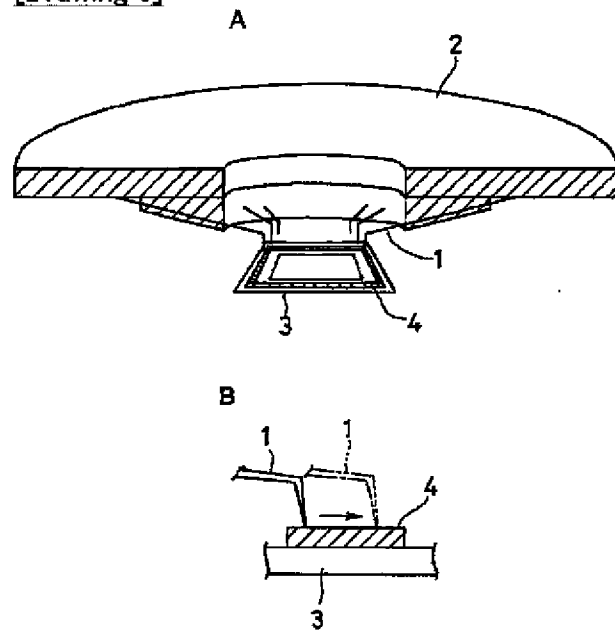
B



[Drawing 4]



[Drawing 5]



[Translation done.]